PH.D SYNOPSIS:

INFORMATION SEEKING BEHAVIOR OF THE PHYSICISTS OF THE SELECTED UNIVERSITY LIBRARIES IN WEST BENGAL: A COMPARATIVE STUDY.

User studies originated with the perception that by understanding user needs and information uses one could design effective information systems. Although Taube (1959)[1] did question the validity of user studies as guides to improving information services, the studies in the subject continued to grow in numbers. By 1977 their estimated figure was 1000.[2] , in the initial stages the investigations were short on methodology which had led Taube to question their validity. But gradually the methods of investigation had improved. The new techniques included sophisticated social science concepts, appropriate techniques of statistical analysis, well designed survey instruments. Consequent upon their application effective case studies were reported. User studies are now refining using even more sophisticated sociological techniques and focusing on system-oriented studies and on background research on cognition and behavior.

Although these studies cover almost all major proportion is devoted to subjects in science and technology. It would be worthwhile to overview these studies and determine trends in information uses and user needs exclusively in Physical sciences, give suggestions for improving user satisfaction.

USER PROFILE

The term 'user' is taken to mean teachers, scientists, research scholars those who are working in the Department of Physics at Burdwan University, Calcutta University, Jadavpur University, Kalyani University and Visva Bharati University for how they seek information for their research purposes.

INFORMATION NEEDS

Information needs depend upon a number of factors such as work activity, discipline, and availability of facilities[4-5]. The needs also depend upon the hierarchical position of the individuals. While managerial scientists require management information more than the science and technology information, the scientists at middle need primarily the latter. Scientists and teachers have different needs because they are working for different objectives. While a scientist is concerned about the need to establish a priority for his discoveries or for any new piece of

information, a teacher whose main activity is teaching may not be working against any such competitions. Accordingly the needs of teachers may not be as great and urgent as that of scientists. A specification that identifies whether the work in hand is basic or applied also stimulates different information needs. Knowledge of what facilities are available in the near vicinity also stimulates information needs. Thus greater the facilities the greater the needs.

The motivation factors for seeking information could be the following:

- current awareness function
- to save time
- to seek new ideas or to validate the current ones
- for making professional contributions
- need to know comprehensively all the information available on a specific subject
- need for quick information service, and easy access to information, like the information available on phone
- need to know the location from where a piece of information is available at low cost

INFORMATION GATHERING HABITS

A number of studies have been made in India to study the relative use of different media. Some of the important studies amongst others are by Krishan Kumar, Anand, Dhakar, Nagrathna, Haravu and Nagaraja.[6-10] at abroad SATCOM study by National Academy of Sciences and the National Academy of Engineering, ASLIB survey on requirements, IFROSS study by Bath University, etc. are some of the important studies on the subject under discussion. It is observed from these studies that the indicators used for determining the relative use of different media are:

- time devoted to the use of media
- Usefulness of the media in providing documents/information which are referenced in the papers published by the user
- perceived usefulness of the media

Herring made a random-observation study of a sample of US industrial physicists in 1969 based upon time devoted to the use of media. This study however remained unpublished. But its findings and those of the studies made by Hannay[11a]and Case [11b] on two samples of chemists were evaluated by the National Academy of Sciences and the National Academy of Engineering and the findings reported in 'Physics Perspectives', NAS, Washington.[12] In this study different

communication channels were ranked as follows: oral personal, pre-prints and reports, research journals, lectures and classes, books and reviews, written personal communication, and other. The important observations were:

1. Physicists, like chemists, spend a sizable proportion of their time, about 15 hours per week, in reception of scientific information, or in give- and oral communication;
2. Physicists spend very little time using abstracts, much less than the chemists;
3. Reading journals, pre-prints and reports, and books and reviews averages typically seven to eight hours per week for research for physicists. Probably chemists spend a little more time on those;
4. At least in large institutions, where opportunities for contact with colleagues are good, physicists are apt to spend much time in person – person scientific conversations.

Dhakar (1979)[8] reported that physicists spend 10.9 hours per week in searching and reading literature. (Mehta reported they spend 20 hours per week). She had ranked the sources of information used buy physicists as follows: review articles, abstracting and indexing journals, consultation with experts and colleagues. But Ravinder Pal Singh (1982)[13] ranked them as abstracting journals, review articles, original papers, books, experts, colleagues. These results are in striking contrast to the ones given by Herring.

Oral communication between physicists consumes 50 percent of their time which finding is confirmed in another study by Nagrathna (1971)[9]

The usefulness of the media could also be measured by selecting an item of information and evaluating the user response as to how he learnt about the same. Applying this technique Herring and Glass-Norwood[14] studied the sources of awareness of publications which the subjects of the sample cited in papers. Fishendon [15] also tabulated sources of awareness of useful hints of information (papers and reports). These findings are also reported in 'Physics perspectives'. Herring ranked different communication channels as follows: research journals, reprints and reports, oral communication, abstracting services, written personal (5%), books and reviews (4%) and others (6%0. The results reported by Glass-Norwood are as journals (37.85%), oral and written (27.0550, abstracting journals (5.15%), talks and meetings (3.15%), lectures (3.15%), preprints (6.15%), books and reviews (8.25%), and others (9.25%). Fishendon study ranked them as journals (36.50%), oral and written (13.15%), preprints (7.15%), abstracting journals

(13.15%), current awareness service (18.25%) and others (11.80%). In addition to the findings already reported, some noteworthy observations are:

1. Despite great amount of time spent in oral communication more leads to published items came from the use of journals than from oral sources. (A recent study by Garg et al also reports this finding by reporting that 79.86 percent users got leads to sources of information in earth sciences from journals). [16]
2. Browsing in journals is a major source of useful information accounting for almost as many leads as the other highly productive category, cross references. (A recent study by Kapoor also supports this finding by reporting that 69.33 of users gathered information by scanning publications.[17]
3. Books and reviews provide a surprisingly small fraction of leads to physicists. But Menzel reports that chemists depend more upon books than physicists, though still much less than on primary and interpersonal sources.

Yet another indicator used for measuring the media usefulness is the subjective evaluation of their relative importance. Using the questionnaire technique Slatter and Keenan[18kl,] and Libby and Jaltman [19] evaluated the media preferences for current awareness functions, research and study. Slatter and Keenan ranked different media as: journals (24.25%), written and oral personal communications (20.25%), abstracting journals (18.25%), preprints and reports (12.15%), current awareness services (5.15%), other (3.70%). Libby and Jaltman ranked them as follows: journals (46%), written and personal oral communication (23%), abstracting services (22%), talks and meetings (5%), other (4%). From these findings it was observed that talks at meetings provide an important source of current awareness, probably comparable in average importance to preprints, and somewhat less important than journal browsing and personal conversations. They are less useful as source of detailed specifications.

In trying to understand the reasons for preferences for specific communication media Rosenberg, [20] Gerstberg and Allen, [21] and Allen[22] in their respective studies suggested that easy accessibility was the major determinant for use. Proximity to library or source of information obviously promotes its use. Menzel [23] also reported that in seeking information scientists follow those paths which place the smallest amount of strain on them.

Mr. Brown Cecelia has studied “Information seeking behaviour of Scientists in the electronic age: Astronomers Chemists Mathematicians and Physicists” that the information seeking

behaviour of astronomers, chemists, mathematicians, and physicists at the University of Okalhoma was assessed using an electronically distributed questionnaire. All of the Scientists surveyed relied greatly on the journal literature to support their research and creative activities. The mathematicians surveyed indicated an additional reliance on monographs, preprints, and attendance at conferences and personal communication to support their research activities. Similarly, all scientists responding scanned the latest issues of journals to keep abreast of current developments in their fields, with the mathematicians again reporting attendance at conferences and personal communication. Despite an expression by the scientists for more electronic services, the majority preferred access to journal articles in a print, rather than an electronic form. The primary deficit in library services appeared to be in access to electronic bibliographic databases. The data suggest that primary goal of science libraries is to obtain access to as many appropriate electronic bibliographic finding aids and databases possible. Although the results imply ultimate demise of the printed bibliographic reference tool, they underscore the continued importance to scientists of the printed peer- reviewed journal article.

TOPOLOGY OF COMMUNICATION

It is about sequence of communication acts involved in getting across useful information from its originator to an ultimate user. It gives an idea how useful information diffuses in the community of the scientists. Within the domain of oral channels communication functions through the mechanism of invisible colleges. Information on current research flows through invisible networks six to twelve months before it reaches in formal publications. The operation of invisible colleges is through informal contacts between scientists. Griffith et al had suggested that informal contacts follow Poisson distribution; a majority having low contact rate and elite whose frequency of contact is about eight times higher than the majority. Crane proposed that growth of a scientific area is initially generated by a few innovators who are then joined by a large number of scientists. The interactions among these innovators and early adopters further attract other scientists. Such interactions account for rapid increase in the number of participating scientists in the area. This model attempts to explain the snowballing effect in science, and the apparent communication between the elites and the non-elites, the diffusion of information between the originator and the user. In a typical organization there exist special individuals- called ‘gatekeepers’- who serve as the focal point of information originating outside the

organization. In terms of Allen gatekeepers are identifiable communication 'stars' that facilitated flow of information from outside and transmit the information to colleagues.[27] As such they also set the pace of diffusion of information. The information habits of 'gatekeepers' are entirely different from those of their colleagues. On an average they read more scientific periodicals and have more information producing contacts with friends outside the organization. AIP conducted a small survey on a group of physicists consisting of basic scientists and industrial scientists.[28] Using the interview technique they were asked:

1.how the specific information he actually used inn two papers(randomly chosen) came to him , that is through reading(what?) or listening (to whom? Where?)

1. How was he cued to it?
2. Did he know how the information (or the knowledge of its existence) got to be the source or cue cited in 1or 2?
3. How much time elapsed between the original discovery of the idea and the apprehension the interviewee?

Some noteworthy conclusions of the study were:

1. Direct transfer of information from the originator to the user such as through preprints, colloquia, oral personal, written personal occurred in about a fifth of cases. Besides the direct communication chain, two more chains occur in the information diffusion process which may be characterized by the number of intermediatories in between the originator and the end user. The great majority of the cases involve a single intermediate repository, most often a journal article and sometimes just the mind of a person. Even less common was the transfer in which two or more intermediate repositories.
2. The actual acquisition by the user of specific information of importance to him occurred through reading a primary journal article in nearly half the cases. In a sizable majority of the remaining cases a journal article constituted one of the steps in the transfer from its originator to its user.
3. In nearly one-third cases the specific information of importance was acquired by the user in oral conversation with a colleague, most often the originator himself, and in other cases frequently a collaborator of the user. In a sizable majority of the remaining cases, an oral personal link played a part, most frequently by providing a lead to printed material.

4. Over half of these oral-personal links were giver- originated; giver-initiated written personal, preprints and reprints links also occurred. In total giver-initiated links occurred in over one third of the transfer chains. There were no conspicuous differences between the communication patterns described by the experimentalists and theoreticalists or between those associated with theoretical and experimental information.
5. In about half the cases, the time interval was no more than about a year, but in most of the remaining cases it was more than five years.
6. For the cases with a long interval acquisition of information via primary research journals was predominant. In a sizable majority of the remaining cases the information was rediscovered, and the contact with the original discovery was made only after research and inquiry. Books and reviews articles played a surprisingly small role in these long - interval cases.

APPROACH TO INFORMATION

Characteristically managerial scientists are preoccupied more with managerial functions than with research functions. Their most time is consumed in activities categorized as policies, planning, and coordination of research programmes between scientific departments. They are generally hard pressed with time, but to keep up with research functions they do depend upon their subordinates for information. Accordingly they delegate literature search responsibilities largely to their assistants, post graduate students and the likes, and expect from them information complete to all respects. Researchers in non-university environments delegate for more than those in universities. The older, senior users are more likely to delegate such functions. Researchers are more willing to delegate retrospective searching than current searching. The feedback from them generally in the form of oral information, written information, etc.

Collaborative studies in science disciplines are responsible for delegation of search responsibilities to team members. Delegation to subordinates is influenced by work activity and this activity is primarily limited to managerial scientists, project leaders. According to an ASLIB survey[6]

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REVIEW OF LITERATURE

USE STUDIES:

A REVIEW

Surveys which are conducted to find out the use of any communication medium, such as primary periodicals, and the secondary periodical etc. are called the use studies.

A large number of use studies have been conducted to find out the relative use of different channels in response to questions like ‘when would you search for information’ or how did you find reference’ etc. The possible channels that could be named in response to such questions are by --- change, personal recommendation, from abstracting and indexing services, as often references, through regular personal of periodicals, etc. At the Washington Conference a number of papers on such studies were presented. (3) Since than many more surveys have been made and their findings are available.

The important studies of this nature – Average of previous surveys’--- both published in 1961 are by and victory respectively. (4.5) with this clarification, it becomes clear that both Voigt and Vickery identified ‘Chance’ (including regular personal) as the important means or channel

locating information. In Voigt's average most important channels i.e. 'abstracts and indexes' in Vickers's average. Although personal recommendation has quite high ranking also. The greatest deviation is regarding the channel 'abstracts and Indexes' which comes down to the fifth of last rank in Vogt's average. It appears the ranking of this consistently high in most of the surveys. A large number of use studies have been conducted to find out the relative use of different channels in response to questions like 'when would you search information' or how did you find the reference' etc. The possible channels that would be named in response to many questions are—by chance. Personal recommendation. From abstracting and indexing services as often references through regular personal of periodicals etc. As the Washington Conference a number of papers on such were presented. (3) Since then, many more surveys have been made and their findings are available.

The important studies of this nature 'Average of previous surveys' – both published in 1961 are by Voigt and victory respectively. [4-5] with the clarification. It becomes clear that both Voigt and Vickery identified 'Chance (including regular personal) as the most important means or channels of locating information. In Volgt's average the second most important channels i.e. 'abstracts and indexes' in Vickery's average. Although personal recommendation has ranking also. The greatest deviation is regarding the channel's 'abstracts' and indexes', which comes down to the fifth or last rank in Volgt's average. It appears the ranking of this channel is consistently high in most of the British studies, including studies by Bernal, Urquhart and other BLLD studies. In fact, in one of the surveys reported by Urquhart it was found , 38 per cont the physicist questions stated that they had found the reference in an abstract Journal……..

This compares with a total of 49 per cent an abstracting journal". [6] Similarly, in Later studies it was revealed that 21 per cent of the Social Scientist and 30 per cent of the Bio-medical workers that the reference had been obtained form an abstracting journal. But in most of the other surveys this occupies an unexpectedly low position. The high ranking of these channels in BLLD surveys as against personal recommendation has been tried to be example by Wood thus "The explanation for this must lie in the fact that the literature borrowed from BLLD is acquire on inter-library loan. It is obtained, therefore, through a library that is most cases do not hold the item. Local research workers, consequently, are less likely to have heard of the item and therefore, to have referred their colleagues. (7)

However, it can be said in general that the choice of the appropriate channel is influenced by a number of consideration like, job function, also organization, qualifications, place of employment, academic discipline, accessibility of information sources, etc, Thus, it has been observed that those who have research and development responsibilities make more use of formal channels like scientific periodicals and abstracting periodicals, than those whose responsibilities are geared to 'Industrial' Production, testing, design etc. Similarly, it has been observed that technologists make more use of oral communication than do research workers. Scientists also use oral or other informal channel, mainly current information. Base of use or easy accessibility seems to be important consideration in the choice of channel irrespective of the amount of information expected.

The John Hopkins University Center for research in scientific communication and the American psychological Association have conducted number of independent studies to find out the efficacy of conference as a communication channels. John Hopkins University studies have revealed that 50 to 68 per cent of the authors of papers had previously made oral presentation of their ideas at regional meetings. Between 32 and 50 per cent of them made written presentation also of the same work. Usually as report of thesis. It was also found out that 78 to 94 per cent authors were to present the same work as periodical articles within three months of the Conference. From the participants point of view it could be said that most of the information gathered from attending of Conference come through informal discussions with authors and others.

Several compilations of use studies exist. The most inclusive bibliography is that compiled by Article (8) in 1971. Her collection of 687 studies for all types of libraries except for special libraries is based upon a review of 1200 studies during the two decades 1950-1970.

A recent analysis by Ford (9) examines over 100 studies conducted in academic libraries. W. Wood (10) presents a useful analysis and summary of the major studies of library use in the period 1930-1964.

D. N. Wood (11) lists use studies conducted during 1966-1970. The compilation by Bates 12 cities 181 studies up to 1968. A major listing has been accomplished by De Weese (13) (597) items and although including several Journal readership surveys, there are many use studies listed.

In 1970 the New York library Association (14) issued a publication including an annotated bibliography on user requirements. This is a selected list 20 pages of paper dealing with use, the making of surveys, and the problems of library use instruction.

At least one specialized collection of use studies exists. This is the compilation of and review of fifty four catalogue use studies by Krikelas (15) which includes a chronology of catalogue use studies, 1931-1970.

The rationale for Library use studies has discussed by Lipetz (16) and Ford Researchers have (or should have) these general theoretical of goals which they wish to

1. Explanation of observed phenomena in library use;
2. The production of user behavior;
3. Control of user behavior by manipulation of conditions.

Questions are the most common devices employed in measuring library use. Among the root appealing attributes of a question is that it allows for easy categorization of questions and tabulation of results. The way in which questions are asked in questionnaire varies. They can be open-ended, multiple choice, or a variety of attitude scales. The most important aspect in the design questionnaire is the careful and appropriate working of the questions used. The techniques of distributing questionnaire are also varied obviously. They can be handed out randomly at exists entrances of buildings, mailed out to a library's real and potential clientele, given to users as they charges out books, or made available to users at their point of conduct within a library. This last method refers to a study (17) that allowed users to register repeatedly their not findings books on the shelf at a large university research library.

The critical incident technique (18) involves the user- non-user telling of memorable event in his information seeking activation. This type of questions can be asked in questionnaires or in interviews. An example of a critical incident technique is the asking of a library user he was or was not satisfied with library services. The collective response to such a question could be analyzed to reveal trends and elements in satisfaction or dissatisfaction.

Observation of the user is one way in which to study use without putting any obvious on the part of the user. Observation could involve following a user (with his consent) about the library and seeing what the user comes up against. This could be unnerving for the user but highly revealing to the observer. An example of the unobtrusive observation in the use of a time-lapse camera in a catalogue room to observe the use of the card catalogue. (19)

Another interesting example of the unobtrusive method is Sommens's study (20) of seating arrangement and performance among library users. His findings, through observation have several implications for library interior design and reveal same characteristics of library users.

Dhakar (1979) reported that physicists spend 10.9 hours per week in searching and reading literature. (Mehta reported they spend 20 hours per week). She had ranked the sources of information used buy physicists as follows: review articles, abstracting and indexing journals, consultation with experts and colleagues. But Ravinder Pal Singh (1982) ranked them as abstracting journals, review articles, original papers, books, experts, colleagues. These results are in striking contrast to the ones given by Herring.

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4. Despite great amount of time spent in oral communication more leads to published items came from the use of journals than from oral sources. (A recent study by Garg et al also reports this finding by reporting that 79.86 percent users got leads to sources of information in earth sciences from journals).

5. Browsing in journals is a major source of useful information accounting for almost as many leads as the other highly productive category, cross references. (A recent study by Kapoor also supports this finding by reporting that 69.33 of users gathered information by scanning publications.[17]
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Yet another indicator used for measuring the media usefulness is the subjective evaluation of their relative importance. Using the questionnaire technique Slatter and Keenan, and Libby and Jaltman evaluated the media preferences for current awareness functions, research and study. Slatter and Keenan ranked different media as: journals (24.25%), written and oral personal communications (20.25%), abstracting journals (18.25%), preprints and reports (12.15%), current awareness services (5.15%), other (3.70%). Libby and Jaltman ranked them as follows: journals (46%), written and personal oral communication (23%), abstracting services (22%), talks and meetings (5%), other (4%). From these findings it was observed that talks at meetings provide an important source of current awareness, probably comparable in average importance to preprints, and somewhat less important than journal browsing and personal conversations.

A survey of the past library literature reveals that a few studies have been carried out which are relevant to the present study. In this context, it is worth mentioning the work of Ching-chich chen on "the use of patterns of physics journals in a large Academic Research Library. (39)

"Chen Investigated the use patterns of the physics journals in the MIT Science Library. The finding are based an analysis of actual use data recorded from all volume and issue left by library users on study tables, and on the trucks in the photocopy areas form March 15 to June 30, 1971.

The primary method of data collection was used by her was a call slips, to circulation charge cards, completed inter-library loan forms, photocopy request forms, questionnaires written requests from users, and many others.

The method used in this study is an actual recording of all bound physics periodical volume and unbound left on the study tables and trollies the Xerox machines, to be reshelved by the Science Library stackers.

“The Science Library contains some 220 physics journals. The study reveals that only 138 journals 62.7 per cent) were used even once during the 3/ ½ month interval. A core of 49 journals supplied 90 per cent of use, and those titles would cost 5105 per cent of the total single subscription costs of the 138 used titles 52. 3 per cent of the use occurs in journal volume less than 6 per cent old. English is the most used language of physics periodicals and the English periodicals account for 95.3 per cent of use. American journals 57.02 per cent of which are published by the American Institute of Physics supply 59.4 per cent of the total use.

Library may have more fiscally stringent times ahead of them. Each may experience more overcrowding of its shelves, and continued decline in financial support. It is reported that the doubling time growth of physics literate is 8.1 years; therefore, an even greater information explosion can be expected. Journal prices continue to increase, and as usual, the prices for science and technology publication are the highest. Thus chemistry and physics are the highest of all. Accordingly, librarians will have to make different decisions on weeding strongly less needed collections, cancellation of subscriptions etc. in the near future.”

It is also worth mentioning the work of Roger Flynn on the use of journal of the Pittsburgh University study. (40) Flynn studied the six science and engineering libraries to determine the use of journals.

The methodology finally developed was a contribution of observation, questionnaire and interview techniques. An observation form was designed, with space of for recording such data: the title of the journals status of user: department of user: alert method: whether the user intended to photocopy the article(s) being accessed. Etc. A preliminary form was developed, tested and revised, and then used in a two-trimester study Physics Library based on experience in the physics library, the form was again revised and the new version was used in studying all other libraries.

Some of the general conclusions common to all libraries were:

1. Uses in general are Law;
2. Larger collections tend to have a grater percentage of Low-use journals. (However, size of the collection is not only the factor influencing the per cent of usage);
3. Usage is primarily of current journals;

4. Browsing is primarily of current journals, while older issue are accessed through some type of references;

5. Over 75 per cent of the articles perused do not result in photocopying;

6. In general, the amount of photocopying done increase with the age the issue;

7. Well over 90 per cent of the photocopy of older issue is initiated by a reference, not by browsing. This indicates that this use could have been satisfied with a copy of the article rather than access to original journals.

Patron Characteristics

1 The principal users of journals are studies; and among students, graduate students are the principal users;

2. Usage among studies is mainly by previous reference; faculty does more browsing;

3. Usages of the special libraries is primarily on a departmental basis, with the Physics department using physics library , the Chemistry department using the chemistry library, and so on, While this may seen a trivial point, the fact of very little crossover among climate of the libraries suggests that resource-charging centre designed along disciplinary lines(distributed network) are worth considering."

Some of the conclusions unique to individual's libraries were;

1. "The Physics Library could be called "Journal-intensive";

2. Largely Library (Life Science, including Psychology) should more browsing of older issue of journals than other libraries;

3. The Physics Library should more usages browsing than all other libraries. This was due in part to the librarian's marketing procedures;

4. The secondary users (graduate students being the primary users in terms of number of users) varied from library to library. For example, the physics library and the Mathematics library should very little undergraduate usages, while the Engineering library and the Computer Science Library did show undergraduate use. The Physics and Mathematics libraries also showed a higher rate of use by family. While the computer library showed very little use by faculty;

5. The Computer Science Library was the only library which was used more often by members of other departments than by its own computer science department members;

6. Also interesting along these inter-disciplinary lines was the fact the chemistry department members used the library, but the Physics department members did not the Chemistry Library."41

In this context, it is also worth mentioning the work of Barbara Rice, on Science periodical use study." (41)

Barbara examined a two semester study of science periodical usages at state University of New York at Albany was conducted to identify little used title for storage or possibly discard. Even in this large multi- disciplinary collection a small core of journals accounted for a large percentage of use. Use patterns over time were also recorded and are reported for selected title. Use ranking are correlated with citation ranking in science citation Index's journal citation Reports. Titles for storages and possible discharge cancellation were successfully identified.

The primary data collection method was used to study of work flow in the room showed that it would be best to record use at the preshelving area. Volumes from the collection line are brought to a pre-shelving area. Where they are sorted by call number.

It was anticipated that different would show title different use patterns and time periods were off ten year blocks. In 1975 Line and Sandison had published a summary of the data which librarians need guiding them in decisions relating to the acquisition, discard, and binding of serials in addition to rare frequency of use. For example, in deciding which to store, the library should know the relative number of users unit shelf space occupied. If a 1950 volume is used half as many times as a 1970 volume, but is only half as thick, both volume show equal density of use.

The major finding and conclusion of the study are given below:

1. Many titles in common were used each semester but there were, for example, 276 titles which appeared during second semester but showed no was first semester. Those titles showing many uses probably reflect research use.

ii. Result correlation between Semesters

There was a considerable consistency semesters for those titles showing the heaviest use. According to the frequency of use for first and second semester for those journals which were the 25 more heavily used based on the totals for first and second semester. Although there were various in ranks, there was significant correlation between them. An overall correlation co-

efficient, of +.66 were calculated between first and second semester ranking. This is significant at the .05 level.

iii. Results – Correlation of use and Citation Frequency

The main purpose of the study was to gain information on which to have to base storage decision, the author's curiosity about correlation of use with citation frequency had been whetted when planning the study. The example titles, multi-disciplinary collection would use correlate with citation frequency as reported in the newly published 'Journal Citation Reports' henceforth referred to as JCR.

The correlation coefficient, r. between the ranks after deleting journals which not appear in JCR was +.06. This is not significant at the .05 levels. A similar calculation, done at the end of the forth semester comparing SUNYA and JCR rank, was +.24. This was higher but was still not significant at the .05 level.

iv Results –Review with Academic Faculty

Once the unused had been identified, they were placed in broad subject grouping (e.g. agriculture, Physic, etc) and lists of them circulated to the academic departments concerned. It was felt that the results would be of interest to the faculty and their input on possible cancellations of present subscription of discard of back runs was sought.

The information needed on which to base storage decisions was obtained, and it was found that use was so concentrated that it was not necessary to determine of use. It was also found that through rank correlated well between semesters. It did not correlate well with in the list of journals used by Institute for Scientific Information. This study is a part of an emerging picture of the use of periodicals in an academic research library."

Information seeking behavior results from the recognition of some need, perceived by the user, who as a consequence makes demand upon formal systems such as libraries information centers, or some other person in order to satisfy the perceived need.

According to Kuhlthau [5] the whole information seeking process consists of the following stages:

(i) Initiation (when a person becomes aware of lack of knowledge or under-standing)

(ii) Selection (at this stage the task is to identify and select the general area to be investigated or the approach to be pursued);

(iii) Exploration (the task is to investigate information on the problem in order to extend personal understanding

(iv) Formulation (This is the turning point of the whole process, when feelings of uncertainty diminish and confidence began to increase , the task is to form a focus from the information encountered in exploration);

(v) Collection (the task is to gather information pertinent to the focused problem);

(vi) Presentation (the task is to complete the research and resolve the problem).

Bates[6] has said that an element of uncertainty is involved in the process of information seeking whittemore [7] and Yovits[8] also propose an uncertainty principle in their theory of information flow.

Belkin [9] Garvey, et al mick ci. Al [11] Thomas and D. Wilson [12] advocate the importance of study of information needs and uses which is clear from the following quotation. "It becomes increasingly clear that the success of information science is more likely to be achieved through adjusting the services to meet the specific needs of an individual rather than trying to adapt the individual user to match the wholesale output of an information system"

Garvey et al examined the different kinds of information that scientists need at different stages.

Blagden showed users some documents that the cases had borrowed and found that users could vividly recall the circumstances surrounding each particular information seeking incident. Durrance" examined public policy information needs of citizens by eliciting statements of problematic situational, activities. Wood" interviewed 136 professional health practitioners and focused tin specific situationally sound information problems. Dervin conducted a study to find the everyday information needs of average citizens and to apply the findings to public library service.

Menzel with his team mates at Columbia University conducted a study survey to analyse, "the relative importance and the interplay of formal and informal channels of communication in the fulfillment of a number of scientific communication function"

The result showed the oft observed conclusion that the scientists and engineers follow those paths in seeking and obtaining information that place the smallest amount of strain and effort to them.

Herner was the first to explain in depth the formal and informal sources of information in science. The major findings of Herner's study showed that pure scientists depended on literature while applied scientists were colleagues dependent in seeking information.

Skelton concluded that libraries were not considered useful by the physical scientists. The physical scientists perceived libraries as sources of supply of information already identified rather than channels by which information might be identified.

The bulk of studies that have been conducted on information needs, use and the requirements of physical scientists lead one to conclude that physical scientists tend to rely heavily in their use of formal sources of information on journals. According to wood[21] this is especially true for scientists who are engaged in research and development.

Packer[22] investigated the methods used by chemists and chemical engineers in Canadian Universities to maintain current awareness he found that 60% of the subjects made use of formal methods of communication (e.g. journals, review books).

A major emphasis on the study of information needs of social scientists occurred in England in the late 1960s'. The investigation into information requirements of the social sciences (INFROSS) was sponsored by the office of Scientific and Technological Information (OSTI). The purpose of the study was to identify shortcomings in the traditional system of information acquisition'.. in order to design improved information systems. The major conclusions of the study were that:

(1) Social scientists placed a high amount of importance on finding reference.

(2) Most of their formal information came from journals,

(3) They depended on informal channels, such as consulting and colleagues and experts for much of their information, and library catalogues and librarians were of little use.

Skeltoir compared the results of thirteen sciences user studies with those of INFROSS and concluded that the most important methods used by physical scientists to retrieve information were respectively citations, abstracting and indexing journals, personal recommendations and chance. Skelton's study' also showed that physical scientists used abstracting journals mainly for current awareness than for retrospective search.

Blaxter reported that the modern scientists derived half of their awareness of current issues from scanning review abstract publications and the remaining quarter from scanning paper titles such as current contents.

According to Parkar and Paisley user studies began emphasizing the importance of informal sources of information only in late 1950 perhaps the most comprehensive study on the informal channel of communication is one that was conducted by the American Psychological Association in the 1916s,

Another study was conducted by Grant the extent of which was to determine information gathering requirements among the industrial personnel in South Africa. The study highlighted the way in which the information moved or was transmitted within the organization. Raising et al conducted, a study that deals with the use of monographic on non- selected works borrowed by biomedical researchers fro Yule Medical library. The intention of the study was to find how the users learnt about the books which they borrowed from the library and whether the books had the information needed by the users. About 21.5% of them said that they came to know of the books by chance and 20% - had consulted the card catalogue, etc.

Uytterschant[30] conducted a study at the University of Ghent. The purpose of the study was to determine (1) the chronology by which the researches (in the social sciences) proceed during this literature search (2) Whether the assistance of a reference librarian is taken into consideration (3) the methods they use to keep abstract of the pertinent current literature.

The study confirmed the finding of the earlier studies that social scientists generally do not delegate literature search. The more experienced literature users generally use more informal techniques for gathering current and retrospective information than the less experienced.

Another questionnaire study was performed by the British Advisory Council on scientific policy. Its purpose was to investigate the information needs of Physicists and chemists. The findings were that there is a general similarity in the information seeking and using habits of chemists and physicists. It also confirmed that pure scientists are more dependent on literature than applied scientists.

Hardegg et al/[31] conducted a study to determine which of a list of 890 medical and scientific periodicals were considered the most important by the members of the medical teaching staff at Heidelberg University. It confirmed the assumption that 'clinicians' are smaller users of literature than 'theorists'.

Chen and Hermon conducted a study and found that there was low use of libraries by citizens. Steig concluded after conducted a study that historians made a lesser use of information sources.

Chen-Chich conducted a study to find the information needs of physicists. He concluded that they use a small number of journals.

Margaret Slater conducted a study to find the information needs of social scientists. The study revealed that there is a communication gap between research and practice in the area of social science. The problem of physical access to information still exists.

David Ellis et al / investigated the information seeking pattern s of researchers in the Physical science and social science. The study did not show any overriding differences between the two groups. The characteristics of the information seeking patterns of the Physical scientists and the social scientists are fundamentally the same. Goldberg found that social scientists used monographs and journals literature to a similar extent. Goldberg's findings were confirmed later on both Skelton and Debont found that social scientists were not very much interested in theses and dissertations. He said this type of materials was very poorly indexed.

With regard to secondary bibliographical sources Brittaier, Gutterman Van Styven dacle and Subrahmanyan[44] found that the social scientists did not make heavy use of bibliographical tools such as bibliographies, indexing and abstracting journals.

Social Scientists rely on formal source monographs and periodicals for their information needs. They do not find libraries particularly important.

Steig found that younger historians tended to be more active library users than older ones. He explained die differences between older and younger historians by the aspiration of younger historians to make their way in the scholarly world through publications.

Psychologists try to explain human behavior by identifying some determinant factors. This is applicable to any user study. Studies in the area of information use point out a large number of factors that affect the information use by physical scientists and social scientists. Some of these factors such as quality, availability, accessibility, and ease of use of material are related to information system while others including seniority, experience, and phase of work, speciality, educational level and professional orientation are inherent in the user's status. Ford mentioned in a review of literature on user behavior in University libraries that accessibility and quality are two main factors which determine the use of any communication channel.

Quite a number of studies have been carried out but no theoretical basis has been developed which can easily explain the phenomenon of information seeking behavior of scientists. It appears that studies on information seeking behavior of scientists are in a theory building phase. More elaborate attempts should be made to work out the theory and principles to explain the nature of
the whole process of information seeking behavior of users.

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Scope and Objectives: The survey would be conducted among the Research Scholars, Post graduate students and the Faculty members of the Department of Physics of the **Burdwan University,** Kalyani University, Calcutta University, Jadavpur University and Visva Bharati **University.**

Objectives:

1. Study the ways by which Physicists seek scientific information.
2. Study how far the existing facilities are available or not
3. Compare the information seeking behavior of Physicists working in the Department of Physics of the Burdwan University, Kalyani University, Calcutta University, Jadavpur University and Visva-Bharati University.

Definition:

Information seeking behavior may be understood as the ways and modes by which Physicists seek scientific information. Physicists for the study have been defined having at least Master's degree in Physics.

Hypotheses:

Keeping the purpose of the study in mind the following hypotheses are given below:

(a) When seeking scientific information the Physicists depend more on verbal source than on published source.

(b) Journals do their own searching rather than depend on the services provided by the library.

(c) Physics abstracts and the Internet searching is the most used abstracting services.

(d) Review journals/ articles are consulted to get information about current developments.

(e) Seminar/ meetings/ conferences provide information about what work others are doing.

(f) Time spent in searching and reading literature about the same.

(g) Physicists do not generally maintain a systematic index of references to publication related to their field.

Methodology:

Methodology are the questionnaires method, interview method and Diary method A questionnaires will be prepared for the consultation of the Physicists of the Burdwan University, Kalyani University, Calcutta University, Jadavpur University and the Visva-Bharati University and these questionnaires will be circulated to the Teachers, Research Scholars and the Post graduate students for collection of their valuable opinion regarding the information seeking behavior of the physicists. About one thousand questionnaires will be circulated of the five Institutions i.e. Burdwan Universit, Kalyani University, Calcutta University, Jadavpur University and Visva Bharati University.

Data Collection methods:

The data for the study would be collected by questionnaire, diary and interview method.

Data Processing:

First questionnaire would be distributed and then collected. These would be classified on the basis of a number of characteristics like type of research being done by the respondent, age group of the respondent and so on, also on the basis of the institutions to which the respondent belongs. Tabulation of data would be the next steps which were to make comparison to reveal patterns calculations would also be carried out.

Data Analysis:

In actual analysis of the data the following headings are proposed

(a) Time (hrs) spent per week in various professional activities.
(b) Use of information sources.
(c) Use of library services.
(d) Use of information services-Indexing, abstracting etc.
(e) Purpose for which indexing and abstracting services are consulted.
(f) Usefulness of seminar/ meetings/ conferences etc.
(g) Ability in keeping up with the new developments.
(h) Need for instruction in the use of library and its resources.
(i) Suggestions for the improvement of the services.

Conclusion and suggestions would be given after collecting the questionnaires from the users of the Burdwan University, Kalyani University, Calcutta University, Jadavpur University **and Visva-Bharati University.**

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